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The Tibiscum project: non-destructive research in Romania

Michał Pisz[a] **and Łukasz Pospieszny**[b]

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INTRODUCTION

In 2011, a non-destructive survey was initiated in Crimea, in the suburbs of Sevastopol, on remains of ancient Roman farms that were part of the *chora* of the Tauric Chersonesos. Non-invasive methods, like earth resistance and kite aerial photography, were applied. Four sites were photographed from the air and two of these sites additionally investigated with geophysics. In 2014, the project received funding from the Ministry of Science and Higher Education of Poland within the frame of "The Diamond Grant" program (grant for 2014–2016). The project was meant as a continuation of the research started in 2011, but on a much bigger scale permitted by the grant. The political situation in Crimea ruled out any action there, however, and the survey had to be carried out in another location (by permission of the grantor).

THE ROMAN FORT AT TIBISCUM

Tibiscum near the modern village of Jupa (Caras-Severin county, Romania) is considered to be one of the best known and investigated archaeological sites in the Banat province. Nevertheless, archaeological excavations have uncovered only approximately 5% of the surface of ancient Tibiscum. The total area supposed to be related directly with this settlement is considered to be about 27 ha. The history of the settlement began after Trajan's Dacian War, when a detachment from a Roman legion established a garrison on the left bank of the Timis (Tibiscus) river.

RESEARCH

The aim of the study was to locate, examine and document Roman settlements, both the known ones and those as yet undiscovered. Non-destructive methods were chosen, such as geophysics (magnetic and earth resistance survey), aerial photography (UAV), and aerial thermography, coupled with traditional field walking surveys, including mapping of the finds. Fieldwork was carried out in October 2014, aiming at locating with the use of GPS coordinates all the known Roman archaeological sites in the Tibiscum area. Some of these have been investigated to some extent, but their wider context is unknown, while many sites are located, but have not been examined. Selected sites were subjected to magnetic prospection in March and April 2015.

No extensive fieldwalking had ever been done in the environs of the Roman fort in Tibiscum, hence the importance of the present survey (Fig. 1). A team of 12 investigators covered a total area

[a] Institute of Archaeology, University of Warsaw, Warsaw, Poland
[b] Institute of Archaeology and Ethnology, Polish Academy of Sciences, Poznań, Poland

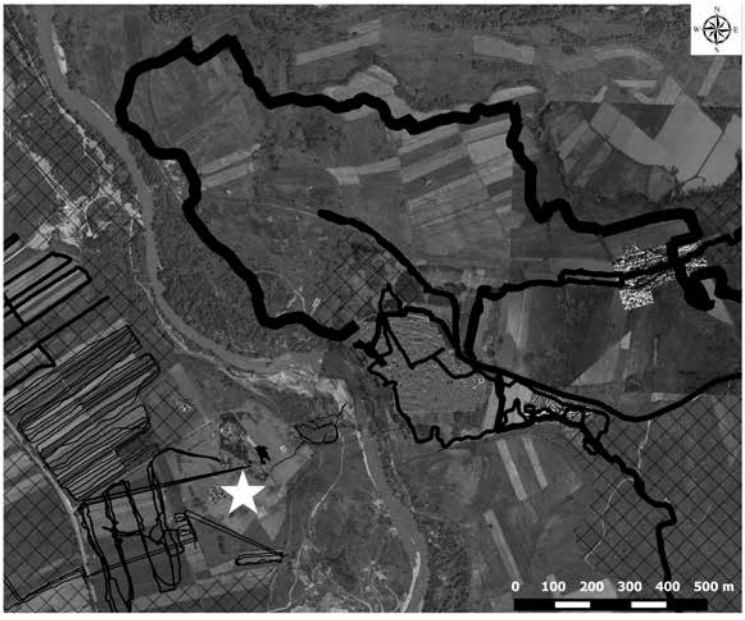

Fig. 1. Area of research. The fort is marked with a star. Results of the magnetic survey, thermography, GPS fieldwalking tracks and orthophotomaps overlaid on a satellite image. GPS tracks reflect actual research spread, the hatched areas being unavailable for prospection

of not less than 5 km^2 and found dozens of archaeological features, including 10 sites or bigger clusters and numerous surface finds. These were registered with handheld GPS devices and put into a GIS database for further analysis. The impressive results of surveys of this kind should encourage standard use of this prospection method by Grad601-2 researchers.

A magnetic survey followed, carried out on both already known sites (*municipium*) and in new locations tracked by the fieldwalking. A fluxgate gradiometer (Bartington Grad601-2) was used, data being collected in parallel mode with a sampling interval of 0.25 m along transects spaced 0.5 m and 1 m. Data processing was performed using Geoplot 3 software. The results revealed many anomalies (linear and orthogonal), especially in areas investigated for the first time. They have been interpreted as induced by necropolis remains (Fig. 2). The negative character of the anomalies may suggest that the structures were constructed of non-magnetic limestone. These ideas need to be verified in the field.

Aerial Thermal Imaging was tested as a method in October 2014, as well as in March and April 2015 (Fig. 3). The method is not widely employed in non-destructive archaeology, apparently due to high equipment costs and the greater popularity of other methods. Promising results have come from experimental application of temperature measurements on the surface of a surveyed area (e.g., Křivánek 2013) and thermal cameras have also been tested in aerial prospection. The best results came from investigations of Roman villas in the territory of Germany, where thermal imaging was performed from a paraglide (Kiesow 2005). The Polish–Romanian Tibiscum Project aims to determine the best conditions for aerial thermal

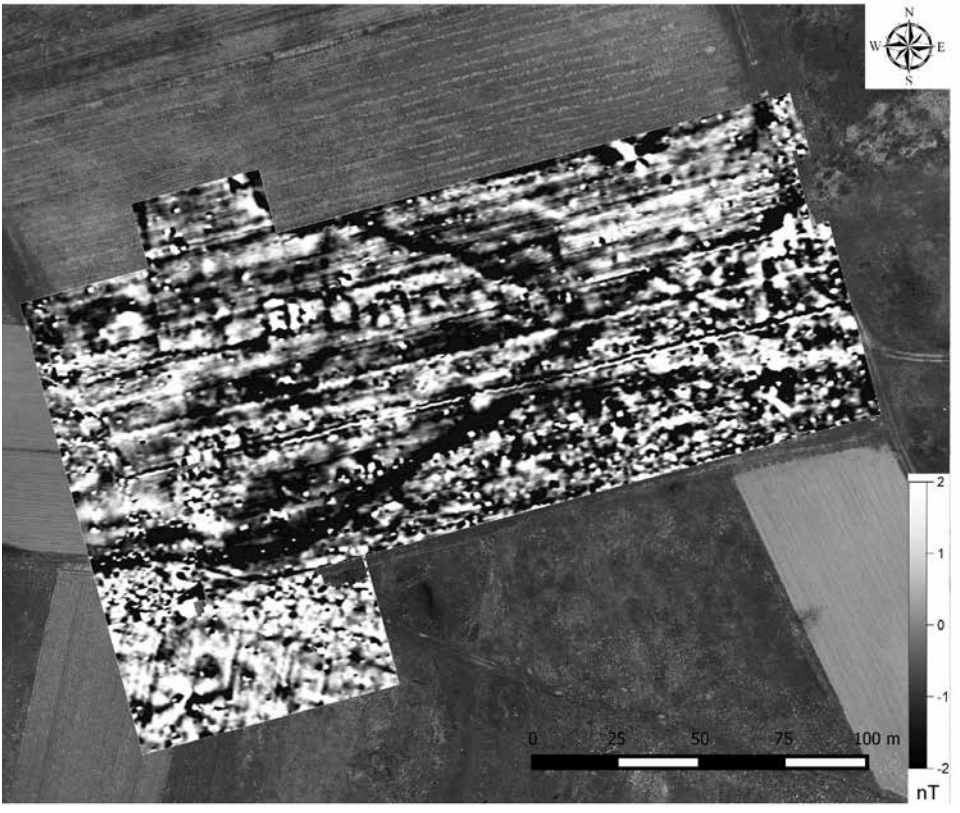

Fig. 2. Magnetic survey. Negative linear anomalies probably correspond to a Roman paved road that is partly visible in the field. The exact nature of the other features needs further verification

prospection and to evaluate the feasibility of this method for revealing features buried at shallow depth. The study takes a holistic approach with research to take place during different calendar seasons, in varying weather conditions and at different hours of the day.

CONCLUSIONS AND PERSPECTIVES

Geophysical prospection is determined by many different environmental factors. Tibiscum appears to be a good site for this type of investigations as conditions there allow all of the planned prospections to be performed, including geophysical survey, fieldwalking, aerial photographical documentation and thermography experiments. At the present stage, the magnetic method can be said to bring positive results, but further verification is needed for the data to be interpreted properly. Earth resistance results depend on the contrasts between the resistivity of investigated objects and its surroundings (Schmidt 2013) and this condition is fulfilled, at least theoretically, at Tibiscum.

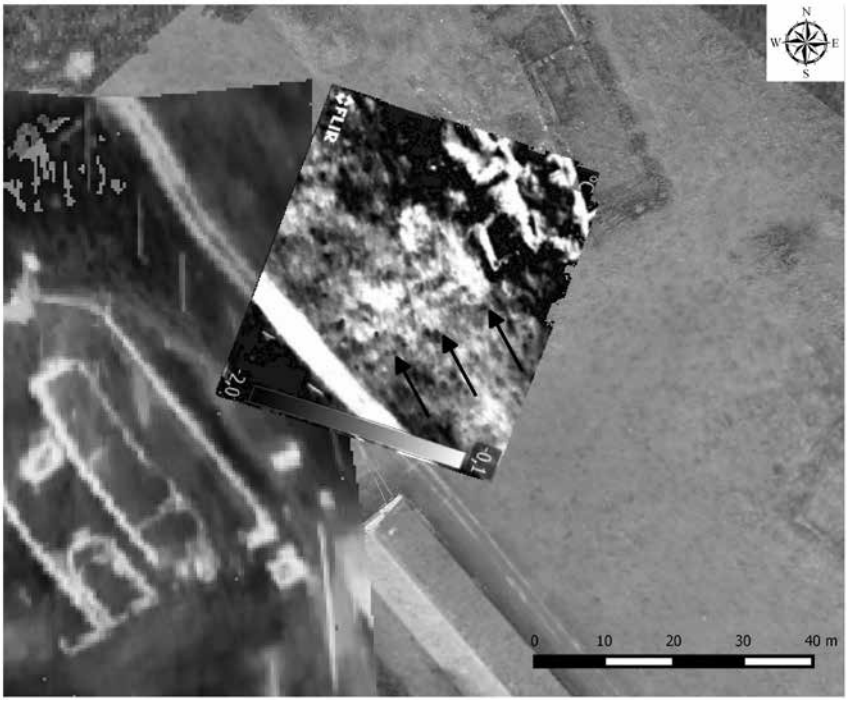

Fig. 3. Oblique aerial thermal pictures, georeferenced and overlaid on an orthophoto image performed from a drone. Arrows point to a positive thermal anomaly visible only on a cold evening after a hot day

The first seasons of field research at Tibiscum have brought important data and convincing results. Many new features and settlement sites from the Roman period were localized during the survey. Indeed, the fieldwalking survey was a significant step in recognizing the landscape around the ancient Roman fort, facilitating the process of merging the results of earlier work done in Tibiscum (see Cîntar 2013) with the results of the new surveys. All the collected data has been put into a GIS database, providing the framework for further analysis. Already (and the project is planned to continue through 2016) our knowledge of the ancient landscape of Tibiscum and its surroundings has been extended considerably.

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